Successful Interspecific Hybridization Between *Phaseolus vulgaris* L. and *P. costaricensis* Freytag & Debouck.

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More than 35 different species of *Phaseolus* native to the Americas are known (Delgado Salinas 1985). Although this Neotropical genus extends from New York south to San Luis in Argentina (Debouck 1994), a large majority of species is found in Mexico. In general, the different species exhibit specificity in ecological adaptation and large variation in morphological traits, but some species can be grouped together because of apparently closer affinities or evolutionary relationships. They are also comparatively more similar morphologically, and in their ability to adapt ecologically. They also show an affinity for crossing and gene exchange. The species forming the secondary gene pool with *P. vulgaris*, on the basis of commonly shared cpDNA polymorphisms (Schmit et al. 1993) are *P. polyanthus* Greenman, *P. costaricensis*, and probably 1 or 2 more taxa. Along the same line of evidence, *P. coccineus* L. would be already somewhat distant from that group (Llaca et al. 1994; Schmit et al. 1993).

The existence of *P. costaricensis* was formally documented and described recently by Freytag and Debouck (1996). Its geographical distribution occurs in the humid montane forests of Costa Rica and Panama at altitudes between 1,400 and 2,100 masl. It has a strong climbing growth habit, reaching 3 to 6 m in height. Only wild forms of *P. costaricensis* are known to exist and the species is apparently not eaten or used locally. It possesses large, dark pink or cerise flowers, and is cross-pollinated. But unlike *P. coccineus*, and like common bean, it exhibits epigeal germination and a fibrous root system.

Whether the eleven available accessions of *P. costaricensis* possess useful genes for resistance to specific biotic and abiotic stresses is not yet known. But the ecology of their natural habitat suggests some tolerance to low temperatures, low soil fertility, and/or diseases prevalent in cool humid regions (e.g. anthracnose, *Ascochyta* blight). Also, this species may act as an alternative donor parent for transferring the allogamy behaviour to *P. vulgaris* when required.

Since the nuclear genome of *P. polyanthus* seems to be heavily contaminated by *P. coccineus* genes (Llaca et al. 1994), making the former species of limited value in widecrossing with common bean (Camarena and Baudoin 1987; Maréchal 1971), we were instead interested in hybridizing *P. vulgaris* with *P. costaricensis*. Initially, one accession (DGD-2119) of *P. costaricensis* was grown in the screenhouse at CIAT-Popayán (1,750 masl, with mean growing temperature of 18°C, and annual rainfall of > 1,500 mm), Cauca, Colombia, where it grew well but did not flower for more than 2½ years. But when stem cuttings from Popayán were transplanted in Tenerife (2,100 masl, 16°C, rainfall of < 900 mm), Valle, Colombia, it flowered in less than four months.

Taking advantage of this long-awaited flowering, portions of racemes carrying about a dozen unopened flower buds and newly opened flowers were taken to the greenhouse at CIAT-Palmira

(1,000 masl, 24°C). There, it was pollinated with common bean cultivar ICA Pijao, a noncarrier of the *Dl*1 and *Dl*2 incompatibility genes (Singh and Gutiérrez 1984). The flower buds of ICA Pijao pollinated with *P. costaricensis* developed normally as if pollinated with another genotype of common bean. Embryo rescue was not needed and the percentages of pod and seed set were comparable with those of intraspecific crosses in *P. vulgaris*. A total of 14 pods and 48 F_1 seeds were produced.

The F_1 seeds obtained from *P. vulgaris x P. costaricensis* cross were grouped into two. The first group was sown in jiffy pots in the same greenhouse (with a mean temperature of 22°C). All seeds germinated and seedlings grew normally until the 3rd or 4th trifoliolate leaves appeared and height was about 40 cm. But then they all began to etiolate and eventually died. We thought the temperature in the greenhouse was perhaps too high for the normal growth and development of the interspecific hybrid. Thus, the second batch of F_1 seed was again sown in jiffy pots, but this time in a growth chamber (with a mean growing temperature of < 18°C). The growth chamber grown seedlings were healthier and not only grew normally after the 4th and 5th trifoliolate leaves appeared but also they began to flower. A total of 27 F_1 plants are currently growing in the growth chamber. Stem cuttings will be made for multiplication and transplanting to fields at Tenerife and/or Popayán. Backcrosses are also being made with ICA Pijao. Some flower buds of F_1 plants will also be allowed to self-pollinate to produce F_2 progenies for further observation.

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